

Listing of Claims:

Claim 1 (currently amended): An in-line production method to manufacture a partially diffusing optical fiber, having numerous longitudinally spaced illumination sites, comprising the continuous steps of:

- a) heating a preform starting material in an oven to form a zone of molten preform,
- b) drawing said molten preform zone to form an untreated optical fiber,
- c) treating said untreated optical fiber with at least one means for diffusion enhancement while said fiber is still continuous with said molten zone, to produce an enhanced optical fiber having diffusion sites, and
- d) repeating said treatment along a desired length of said fiber to form a desired pattern of said diffusion sites prior to severing said enhanced fiber from said untreated fiber; and
- e) providing a protective outer coating to said enhanced optical fiber having diffusion sites producing said partially diffusing optical fiber.

Claim 2 (original): The method according to claim 1, wherein said means to enhance the diffusion is selected from the group consisting of particle implantation, ion-implantation, high-energy laser, chemical, surface deposition, abrasion, and heating.

Claim 3 (original): The method according to claim 1, wherein said means for diffusion enhancement are applied in selected combinations to treat said optical fiber.

Claim 4 (original): The method according to claim 1, wherein said means for diffusion enhancement create patterns selected from a group consisting of random, radial, Bragg gratings, gradient index, step index and custom patterns.

Claim 5 (original): The method according to claim 1, wherein all diffusion enhancement of said fiber is performed in a hot zone of said process prior to said fiber being coated with a polymer coating.

Claim 6 (original): The method according to claim 1, wherein at least some diffusion enhancement is performed inside a hot zone of said process and at least some diffusion enhancement is performed outside said hot zone.

Claim 7 (original): The method of according to claim 1, wherein said untreated optical fiber is drawn through a clean tube upon leaving said molten zone to protect said untreated optical fiber from contamination.

Claim 8 (currently amended): An apparatus for in-line manufacturing a partially diffusing optical fiber comprising:

means to melt a fiber optic preform starting material;

means to draw said preform into a fiber, wherein said drawing means is in series with said melting means;

means to protect said fiber from contamination until a protective coating is applied in-line, said means surrounding said fiber ;

means to control fiber draw speed in electro/optical connection to said drawing means;

~~means to control fiber enhancement patterns;~~

means to maintain a hot zone after said melt zone; and

at least one means to enhance diffusion in said fiber and positioned along a length of said protection means and proximate to said fiber;

means to control said diffusion enhancement sections along said fiber's length; and

means to apply said protective coating of said partially diffusing optical fiber.

Claim 9 (original): The apparatus according to claim 8, wherein said means to protect said fiber from contamination is a clean tube.

Claim 10 (original): The apparatus according to claim 8, wherein said means to enhance diffusion is selected from a group consisting of particle implanters, ion-implanters, high-energy lasers, chemical vaporizers, chemical sprayers, surface deposition devices, abrasion devices, and heaters.

Claim 11 (original): The apparatus according to claim 10, wherein said means to enhance diffusion are positioned along a length of said fiber and axially about said fiber.

Claim 12 (original): The apparatus according to claim 8, wherein the means to control fiber draw speed and means to control diffusion enhancement means is a computer.

Claim 13 (currently amended): A partially diffusing optical fiber produced by the in line production method according to claim 1, where said fiber is produced in commercial lengths.

Claim 14 (original): The partially diffusing optical fiber according to claim 13, wherein said fiber is cut to custom lengths at time of use.

Claim 15 (currently amended): A distributed sensor comprising a light detector coupled to a partially diffusing fiber, produced according to the in line production method of claim 1, wherein light energy entering said diffusing fiber is monitored to provide information about an environment where said diffusing fiber is placed.